

Environmental and Policy Approaches for Promoting Physical Activity in the United States: A Research Agenda*

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Background: Environmental and policy approaches are promising strategies to raise population-wide rates of physical activity; yet, little attention has been paid to the development and prioritization of a research agenda on these topics that will have relevance for both researchers and practitioners. **Methods:** Using input from hundreds of researchers and practitioners, a research agenda was developed for promoting physical activity through environmental and policy interventions. Concept mapping was used to develop the agenda. **Results:** Among those who brainstormed ideas, 42% were researchers and 33% were practitioners. The data formed a concept map with 9 distinct clusters. Based on ratings by both researchers and practitioners, the policy research cluster on city planning and design emerged as the most important, with economic evaluation second. **Conclusions:** Our research agenda sets the stage for new inquiries to better understand the environmental and policy influences on physical activity.

Keywords: evidence-based, exercise, physical activity, practitioners, research

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Although the multiple health benefits of regular physical activity are well documented,¹ more than half of US adults do not participate in physical activity at recommended levels.² For behaviors such as physical activity that prevent chronic diseases and have a graded risk and continuous distribution,³ the objective of prevention efforts should be to foster an upward shift in the distribution of physical activity in the population. For example, it is estimated that even with a small increase in population levels of physical activity, as many as 30,000 to 35,000 deaths per year could be averted in the United States.⁴

Two principles should guide efforts to increase physical activity. The first principle is that a greater understanding is needed regarding the effectiveness and reach of specific environmental and policy interventions for promoting physical activity as recommended by authoritative groups.⁵⁻⁷ These approaches are designed to help people develop healthier behaviors by providing opportunities and support, as well as cues to be active.⁸ Such interventions can benefit all people exposed to the environment rather than focusing on changing the behavior of one person at a time. Environmental and policy approaches may directly affect behaviors (eg, the price of gasoline affecting automobile use) or they may alter social norms (eg, seeing many active people in a neighborhood may prompt a greater acceptance of physical activity). Importantly, environmental and policy approaches are oftentimes more permanent than programs focused on behavioral change at the individual level, and thus, there is reason to expect long-term effects on behavior from such approaches. Even though there is a growing body of research on physical activity and the physical environment (ie, the built environment that involves the design and infrastructure of our communities),^{9,10} the evidence base for many policy interventions is sparse and the conceptual issues are underdeveloped.¹¹

The second principle is the need to combine evidence-based practice (ie, prioritize implementation of interventions shown to be effective and consistent with community preferences)^{12,13} with practice-based evidence (ie, evidence that is developed in the *real world* rather than in highly controlled research conditions).¹⁴ In particular, for research on the environment and physical activity, there is a need to involve several diverse disciplines (eg, public health, urban planning, transportation planning, leisure studies) to combine their conceptual perspectives and methods.¹⁵ Practitioners consistently want to have a higher level of influence over the production of research (eg, which research questions are addressed),¹⁶ and client-driven research tends to enhance the use of evidence in policy settings.¹⁷ Unfortunately, research agendas are often developed by funding agencies or individual research teams without broad input from the research and practice communities. This lack of broad input can lead to gaps in the knowledge base, resulting in part from not always funding the highest priority research.

To contribute scientific knowledge in this area, the Physical Activity Policy Research Network (PAPRN) was established in 2004. The PAPRN is a thematic network of the US Prevention Research Centers program with a goal of identifying which policies are effective in increasing physical activity in communities (see <http://prc.slu.edu/paprn.htm>). Relying on input from hundreds of researchers and practitioners, the PAPRN recently led an effort to systematically develop a research agenda for promoting physical activity through environmental and policy interventions. The current article reports the findings from this effort.

Methods

Concept mapping was used to develop the research agenda; this technique provides a visual representation of the complex relationships among ideas and integrates qualitative and quantitative methods.¹⁸ In addition, it provides broadly dispersed participants with the opportunity to identify ideas and participate in the interpretation of their group perceptions.¹⁹ This process is considered particularly appropriate for obtaining information regarding group-level definitions and perceptions as opposed to individual conceptualizations.^{20,21}

Concept mapping includes 6 steps: preparation by selecting a group of participants and determining the primary question or focus, group brainstorming to generate statements, structuring statements through a sorting process to create clusters, representation of the statements/clusters by using a map, interpretation of the maps, and use of the maps.²¹ In the current instance, a core group of researchers and practitioners ($n = 10$) oversaw all aspects of the project. For this study, we defined a *researcher* as a person whose primary role involves conducting scientific studies (eg, in a university) and a *practitioner* as a person whose primary role involves development and delivery of public health interventions (eg, in a state health department). These individuals represented the many disciplines that could influence physical activity,¹⁵ including public health, transportation, parks and recreation, and urban planning.

Step 1: Preparation

The core group defined the focus statement and determined the appropriate sample. The focus statement for this project was, "One research topic that will best inform policy or environmental approaches to physical activity promotion is . . .". The core group initially identified and nominated 641 persons from a variety of disciplines representing both researchers and practitioners across the United States to participate in the concept-mapping process.

Step 2: Brainstorming

Brainstorming sessions are used to generate research topics in response to the focus statement. After an initial screening to identify invalid e-mail addresses, beginning in October 2006, 600 participants were invited to participate by generating research ideas via a secure Web site. Because participants submitted their ideas anonymously, we could not calculate exact response rates or the average number of responses submitted per respondent. Members of the core group reviewed the research ideas generated through the brainstorming process and distilled 109 unique research topics from the materials submitted.

Step 3: Structuring of Ideas

During November and December 2006, the same group of participants was asked to complete 2 online surveys that listed the 109 research topics. On 1 survey, participants rated each idea on its importance relative to the other ideas, and on the other survey, they rated the feasibility of implementing the idea in the next 5

years (scores ranged from 1, *relatively unimportant/not feasible*, to 10, *extremely important/feasible*) using the same secure Web site. One hundred and seven participants completed the importance rating scale (18% response rate), with 88 also completing the feasibility rating scale (15% response rate).

As a subset of the group described in step 2, a smaller group of participants ($n = 20$) who were selected for their familiarity with the field of physical activity were asked to individually sort (group) the research ideas into themes or categories based on the similarity of ideas. These participants were asked to create their own categories. They were told that each statement could be placed into only 1 category, and the sorting process should result in more than 1 category but fewer categories than the total number of ideas.

Step 4: Representation

Data from the sorted and rated ideas were entered into the Concept Systems software (see www.conceptsystems.com).²¹ The software takes the data and performs cluster analysis and multidimensional scaling (MDS) to allow for visual representation of the data in the form of clusters. This analysis groups or partitions the ideas on the map as they were placed by the MDS into clusters of ideas located in contiguous areas of the map. Items that were similarly categorized by several participants appear closer together on the map than those items that were not frequently sorted together by participants. The final “concept map” presents an arrangement of these clusters of ideas. A standardized, systematic process is applied to identify the most useful number of clusters by considering the range of issues represented, the purpose and intended uses of the resulting map, and the observed coherence of clusters at different levels.¹⁹ Each cluster was named by the core group based on the set of ideas within the cluster.

In addition to the concept map, “Go-Zones” were created to compare ratings of subgroups at the idea level, within clusters. Go-Zones are scatter plots of all the ideas represented in the clusters, with the mean importance rating on the x -axis and the mean feasibility rating on the y -axis. The graph is divided into 4 quadrants: the upper right quadrant represents ideas rated as both highly important and highly feasible; the lower right, highly important, but less feasible; the lower left, not important and not feasible; and the upper left, not as important, but feasible. Go-Zone graphs were created to represent the perspective of researchers and of practitioners in an effort to identify areas of congruence and disagreement.

Steps 5 and 6: Interpretation and Use

Twenty-six individuals (20 of whom had sorted the research ideas) from diverse backgrounds participated in an in-person meeting in February 2007 to review the concept map and Go-Zones. After an initial discussion of the results and potential products, the participants were divided into 5 work groups. Each work group was assigned 1 or 2 clusters of research ideas to review and were asked to respond to 3 questions:

1. To study the top-priority issues identified by our process, what are some tools/methods that would be useful in studying each issue?

2. How might various disciplines and professions work together to address these research areas?
3. What actions need to be taken to move this research agenda forward as quickly as possible? By whom?

Results

Among those who brainstormed ideas in step 2 ($n = 238$), 42% were researchers, 33% were practitioners, and 25% were in a variety of other categories (all were self-identified). Among the 107 persons who rated statements for importance and feasibility (step 3), 58% were researchers and 42% were practitioners.

Analysis of the concept-mapping data resulted in a map with 9 distinct clusters (Figure 1). The number of statements in each cluster ranged from 8 (for City planning and design and Implementation of policies clusters) to 17 (Measurement/methodology cluster). On the map, a smaller cluster suggests a tighter grouping of statements in that domain (ie, more agreement among raters) and the distance between clusters suggests conceptual similarity or difference (with greater distances suggesting less conceptual similarity between clusters). The cluster layers indicate the overall importance of the statements in the cluster, with more layers suggesting higher importance. The highest priority statements within each cluster are shown in Table 1 (the full set can be found at <http://prc.slu.edu/paprn.htm>).

Based on the item ratings of both researchers and practitioners, the cluster on City planning and design emerged the most important, followed by Economic evaluation. Pattern matching showed that there was a high overall concordance between researchers and practitioners on importance ($r = .86$).

For feasibility, both researchers and practitioners assigned the highest rating items in the Schools cluster. The next most feasible cluster was Population sub-groups among researchers and Measurement/methodology among practitioners. As with importance ratings, pattern matching for feasibility showed high agreement between the 2 types of respondents ($r = .77$).

A third set of pattern matches compared ratings for importance among practitioners with ratings of feasibility among researchers (Figure 2). The rationale for this analysis was that practitioners are likely to be closer to what is needed in communities they serve (which could be defined as importance), whereas researchers are closer to the research process and thus might be better equipped to rate feasibility. Based on the rating process described earlier, the range in mean values for importance was 5.74 to 7.21 and the range for feasibility was 5.21 to 6.54 (on a scale of 1 to 10). These analyses showed an inverse correlation between importance and feasibility ($r = -.56$).

These results were presented at the in-person meeting for review (steps 5 and 6). In discussing the tools and methods that could help advance the agenda, several similarities among the work groups were noted. First, all groups reported a need for more specific surveillance tools for research topics ranging from economic evaluation, to community planning and design, to schools and special populations. It was noted that the surveillance tools should be designed to be easily accessible to the practitioners or communities that want to use them. Several groups mentioned that a menu of surveillance tools would be helpful to tailor assessments to specific

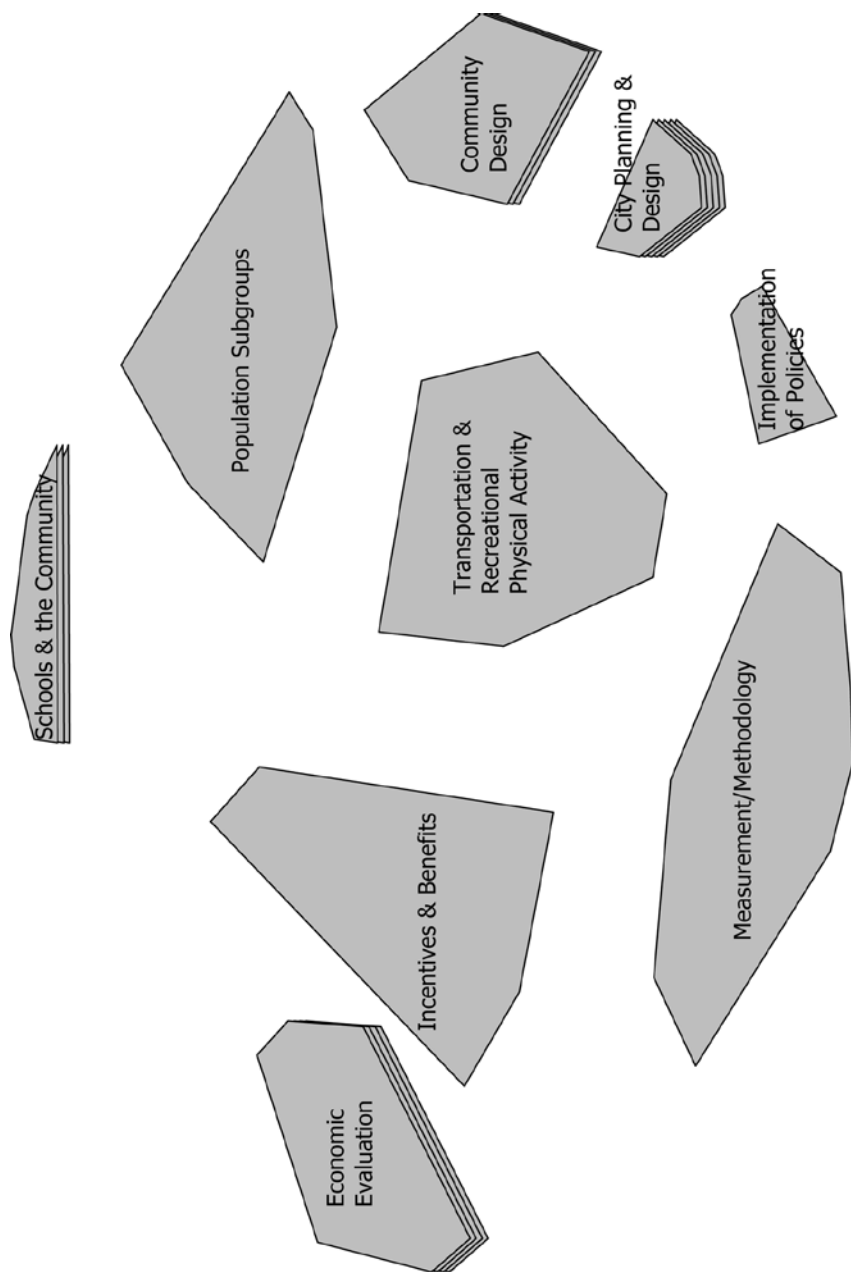


Figure 1 — Cluster map for environmental and policy research agenda, United States, 2006 to 2007.

Table 1 Examples of Top-Priority Statements by Cluster, United States, 2006–2007

Cluster	Statement ^a	Total score ^b	Importance score	Feasibility score
Population subgroups	• Identify what low-income young people and their parents cite as the greatest barriers to physical activity in urban areas. • Assess how parental perceptions of safety affect physical activity levels in youth.	14.68	6.31	8.37
Schools and the community	• Assess the effects of walking to school/Safe Routes to School programs on physical activity among youth. • Measure levels of physical activity in communities that have schools open to the community outside of regular school hours. • Assess the effect of daily physical education and/or physical activity on attendance and academic performance of students in K–12 students.	14.23	6.38	7.85
		14.46	6.93	7.53
		14.04	6.30	7.74
Transportation and recreational physical activity	• Study communities with successful programs that enable citizens to easily engage in physical activity.	14.11	6.62	7.49
	• Identify the barriers to creating more recreation space in urban or low-income communities.	13.27	6.33	6.94
Measurement/methodology	• Conduct assessments before and after an environmental change that is set to occur (natural experiments). • Identify surveillance strategies to monitor policy and environmental changes and related health outcomes at the community level.	13.99	7.42	6.57
	• Identify what resonates with legislators/decision makers to support policies to increase the duration and quality of physical education.	13.70	7.17	6.53
Incentives and benefits		13.79	6.63	7.16

Community design	• Understand the relative contributions of actual crime (an objective measure) and fear of crime (a subjective measure) to levels of physical activity.	13.27	6.35	6.92
	• Determine whether mixed-use development actually increases walking and biking.	13.64	7.30	6.34
	• Assess how perceptions of barriers interact with the built environment to predict physical activity behavior.	13.28	6.67	6.61
Implementation of policies	• Understand the barriers to implementing policies that promote walkable communities.	13.53	6.58	6.95
	• Identify the barriers and potential impacts of a policy to allow for bikes on all modes of public transportation.	12.53	5.72	6.81
Economic evaluation	• Identify effective planning and implementation strategies for creating policy changes in physical activity.	12.47	6.60	5.87
	• Identify which workplace policies result in more employees meeting recommended levels of physical activity.	13.38	6.93	6.45
	• Evaluate the economic impact on retail businesses of enhancements to walkability like traffic calming, tree-lined streets, and sidewalk enhancements.	13.26	6.96	6.30
City planning and design	• Assess the types of policies (eg, zoning) that are most influential in affecting the built environment.	13.06	7.30	5.76
	• Design and evaluate community-based interventions that incorporate environmental change.	12.88	6.96	5.92
	• Assess how city planning impacts the built environment and the promotion of physical activity.	12.84	7.21	5.63

^a These highest-priority statements were selected from the upper right quadrant (highly important and highly feasible) of the Go-Zones.

^b The sum of the average scores for importance and feasibility.

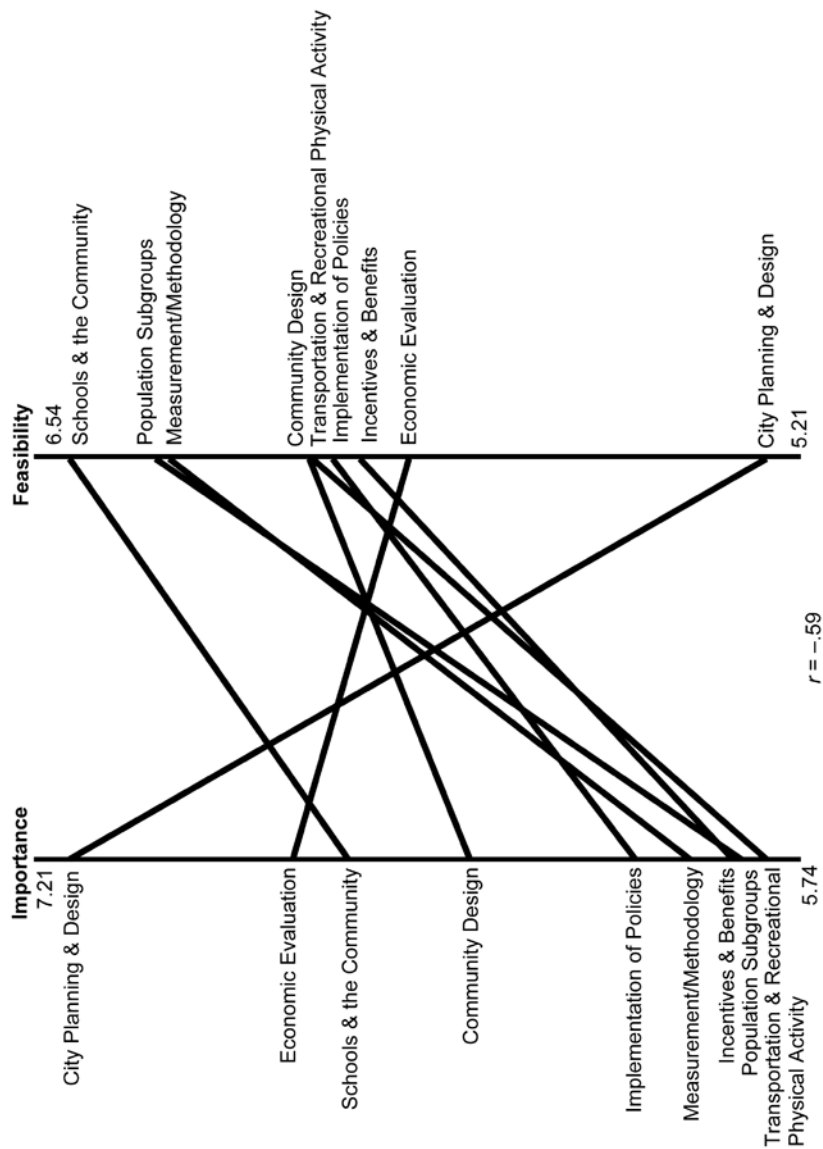


Figure 2 — Pattern matches for importance (practitioners) and feasibility (researchers) for environmental and policy research agenda, United States, 2006 to 2007.

areas based on the policy or environmental change desired. Second, evaluation of “natural experiments” (ie, ongoing environmental and policy change in local communities) were discussed as a way to study outcomes of policy and environmental change. Although these were mentioned as an ideal research method, their expense and complexity were noted as barriers. Third, all groups mentioned that research in this area should include qualitative and participatory components such as interviews, focus groups, and key informant surveys.

The second question for the work groups (which involved disciplines and professions working together) elicited responses that fell into 2 main areas: communication and dissemination. It was concluded that we need better ways of communicating among the different disciplines so that work is not duplicated and that we need to make the best use of synergistic efforts. Even though the goal of projects might be the same, reasons for involvement might vary. For example, health advocates might want a more walkable neighborhood to promote walking and reduce the risk of obesity. Developers might want to make a neighborhood walkable because of the economic impact; and transportation planners might want to abate traffic. Making other disciplines aware of shared goals and visions is paramount. Communicating about projects and goals is only part of transdisciplinary research. The work groups noted that the dissemination of results and tools needs to be geared toward a broader audience of individuals and groups who can use the information to change policy or practice. Surveillance tools and reports of results should be creatively disseminated across disciplines.

The last question for the work groups (about moving the research agenda forward) elicited a response that funding was a key issue. To go beyond basic correlational or descriptive research, a long-term commitment from funders is needed. More rigorous prospective and complex evaluation research studies (eg, participatory multisite studies) can be costly.²² Another action issue discussed was the creation of research teams that could be ready to conduct studies or evaluations should the opportunity become available (eg, natural experiments). These “rapid response” teams would include people across disciplines who can respond quickly with tools to conduct baseline measurements, as well as needs assessments.

Discussion

Long-term trends in physical activity in the United States show relatively stable or slightly increasing levels of leisure-time physical activity, declining work-related activity, declining transportation activity, declining activity in the home, and increasing sedentary behaviors.²³ These long-term patterns have contributed to the alarming rise in obesity rates since the mid-1970s.^{24–26} Individual-level interventions that reach small numbers of volunteers are unlikely to materially affect activity patterns and trends that impact the majority of the population.^{5,27} Correspondingly, a consensus has emerged that to offset these trends, environmental and policy approaches are the most promising strategies for long-term population-wide change.^{5,7,28,29} Little attention, however, has been paid to the development and prioritization of a research agenda with relevance for both researchers and practitioners.

The concept-mapping process resulted in 9 distinct clusters of research topics, indicating that researchers and practitioners identified a diversity of research needs.

Some clusters were specific to settings, such as community design and schools, and one dealt with population subgroups, emphasizing the need to eliminate disparities in both physical activity and access to relevant resources. Specific policy areas identified were city planning and those relevant to transportation and recreational physical activity. More general policy issues were economic evaluation, incentives, and implementation of policies. Several topics related to measurement and methodology, including more rigorous study designs. The strong correlations between researcher and practitioner ratings of importance and feasibility were encouraging, because these disparate groups were found to largely agree on priorities. However, the inverse correlation between importance and feasibility ratings suggests it might be difficult to take the next step in identifying a shorter list of research priorities that can be pursued by funding agencies. Within each cluster, specific research topics were identified that were high on both importance and feasibility, so these specific research topics should be the starting place for identifying priority study ideas.

Current efforts to build such a research agenda differ from past efforts to stimulate and guide research on physical activity in several important ways. First, the concept-mapping process is systematic and has been applied successfully to numerous other important public health efforts.^{30–33} We focused exclusively on environmental and policy approaches, an area of physical activity research that is not well developed.^{8,11,34,35} Our research agenda was developed with input from over 200 persons across the United States. This group included a large number of practitioners, representing diverse disciplines (eg, urban planning, schools, public health). Although there have often been calls for more collaboration between academicians and practitioners,^{16,36–38} we could find few examples where these groups jointly set out a research agenda. A productive collaboration may include a diverse set of partners (Table 2). Whereas a full-scale participatory approach to research would include extensive input from community members themselves,^{39–41} our approach takes an important step in that direction by obtaining broad input from practitioners, who are more likely to have community contact than are researchers.

Our research agenda extends the earlier work of Dannenberg and colleagues,⁹ who called for additional efforts to set priorities among research issues based on considerations such as feasibility and impact on health. The concept-mapping process allowed us to obtain diverse perspectives, organize responses with MDS and hierarchical cluster methods, and rate ideas on importance and feasibility.

Although our research agenda provides a springboard for action, several limitations of our approach should be kept in mind. First, in reducing the original set of 600 research ideas to a manageable list for rating and sorting, both specificity of ideas and context were lost. Second, although it is crucial to address local context (eg, local priorities, the social environment) as research questions and protocols are being formed, our broad process does not account for local conditions. A third limitation is that the 2 essential dimensions for our ratings, importance and feasibility, were summaries based on multiple considerations. For example, to be “important,” at least 3 dimensions are relevant: (1) What is the potential population-wide impact of an evidence-based intervention? (2) Does it accelerate the elimination of health disparities? and (3) Does it add information on an intervention that is in widespread use but has not been rigorously evaluated? Similarly, feasibility has various characteristics and limitations. We used a window of 5 years to rate feasibility but certain issues on our list might take longer than 5 years, and

Table 2 Examples of Transdisciplinary Partners for Conducting Research

Specific fields/Disciplines	Persons	Organizations structures
Transportation (eg, departments of transportation)	Policy analysts	Neighborhood crime watch groups
Public health (eg, departments of health)	Economists	Nonprofit agencies
Health policy	Bankers	Coalitions
Health law and school law	Urban planners	
Education	Statisticians	
Parks and recreation	Social marketing experts	
Health insurance	Physical activity researchers and practitioners	
Hospitals	Legislators and legislative aides	
Bicycle/pedestrian organizations	Medical/health care providers	
Voluntary agencies	Community organizing/advocacy/community activists	
Local businesses	Real estate developers	
Media		
Marketing		
Architecture/landscaping		
Law enforcement		
Foundations		
Funders (federal/national, state, regional, local)		

nearly all of the research areas depend on sufficient resources. Some issues that are highly important might also be more difficult to study (eg, city planning and design), especially within 5 years. And yet, for an issue with a high potential payoff, the extra time and effort in researching a critical topic is worthwhile. Our findings are not based on a random sample of researchers and practitioners and although our response rate might appear low compared with population-based surveys, it is comparable to similar projects³³ and produced a rich set of ideas.

Another concern is that the concept-mapping method yielded research ideas, not a detailed set of question and hypotheses, which would need to be developed for a full research protocol. There is often a tension, however, between conducting rigorous research and the need to act. For a large-scale research project, it might take 5 to 10 years to obtain funding, conduct the study, analyze the data, and disseminate results. In the meantime, practitioners are faced with an urgent issue (eg, rising obesity rates^{24,26}) and the need to take immediate action. Therefore, a high priority

should be placed on the evaluation of natural experiments in which researchers add a strong evaluation to a policy that is currently being implemented or soon will be. Another concern is that the isolation of single ideas in our research agenda might overlook the importance of cross-cutting, ecological approaches that occur in various settings and populations.¹⁵ Research on policy should include a continuum from identifying determinants of the formation of policy to understanding the outcomes of enacted policies.¹¹ Placing the research domains we generated in a framework such as that described by Schmid and colleagues¹¹ would allow experts to identify specific research gaps that need filling across a continuum.

Accomplishment of this research agenda will require a variety of tools and approaches including qualitative approaches, quantitative methods, and participatory approaches.^{39,42} In some cases, new methods are emerging that are showing promise. For example, evidence-based policy making can be supported by a health impact assessment (HIA).⁴³ HIAs, much like environmental impact assessments, allow us to assess the impact that changes in policies, urban planning, transportation modes, and other alterations to the built and policy environments would have on the health of members of the community.⁴⁴ In San Francisco, it was shown that an HIA can influence policy on land use in a way that advances equity and public health.⁴⁵ HIAs are only as good as the evidence on which they are based, however.

Implementation of this research agenda will need coordination and strategic planning. Our work to date is not a strategic plan but rather an agenda identifying important and feasible research topics. Because the amount of research on physical activity policy is still small and the number of physical activity researchers who can do high-quality policy research is limited, it is important that efforts are made to expand in both areas. This is the primary purpose of the CDC-funded PAPRN. By linking public health practitioners and researchers with policy scientists in high-quality research on physical activity policy, the overall capacity to do such research will be enhanced while simultaneously providing policy makers with valuable guidance on policy.

Conclusion

Although our research agenda sets the stage for new inquiries to better understand environmental and policy influences on physical activity, considerable effort will be needed to implement this ambitious set of ideas. In other areas of public health, including sanitation, mass vaccination, and tobacco control, environmental and policy approaches have accounted for much of the improvement in health status.^{46,47} It is likely that environmental and policy strategies could similarly affect rates of physical activity. To identify, prioritize, and implement these interventions, however, more practice-based evidence is needed. This can be obtained by systematically implementing our research agenda.

Protection of Human Participants

Human subjects' approval was obtained from the Saint Louis University institutional review board.

Acknowledgments

This study was funded through the Centers for Disease Control and Prevention contract U48/ DP000060 (Prevention Research Centers Program's Physical Activity Policy Research Network), Active Living Research (a national program of The Robert Wood Johnson Foundation), the National Society of Physical Activity Practitioners in Public Health, the National Association of Chronic Disease Directors, and the Directors of Health Promotion and Education.

We are grateful for the valuable advice from the following persons: Sumra Aytur, Terry Bazarre, Laura Brennan Ramirez, David Buchner, Angie Cradock, Mark Doescher, Kelly Evenson, Sheila Franklin, Corinne Kirchner, LaDene Larsen, David Levinger, Robin McKinnon, Karen Petersmarck, Philip Troped, and Tina Zenzola.

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